

Harnessing the Industrial Metaverse and AI

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SIEMENS

Industrial Metaverse – unlocking a wide range of innovative applications: Digital Twin

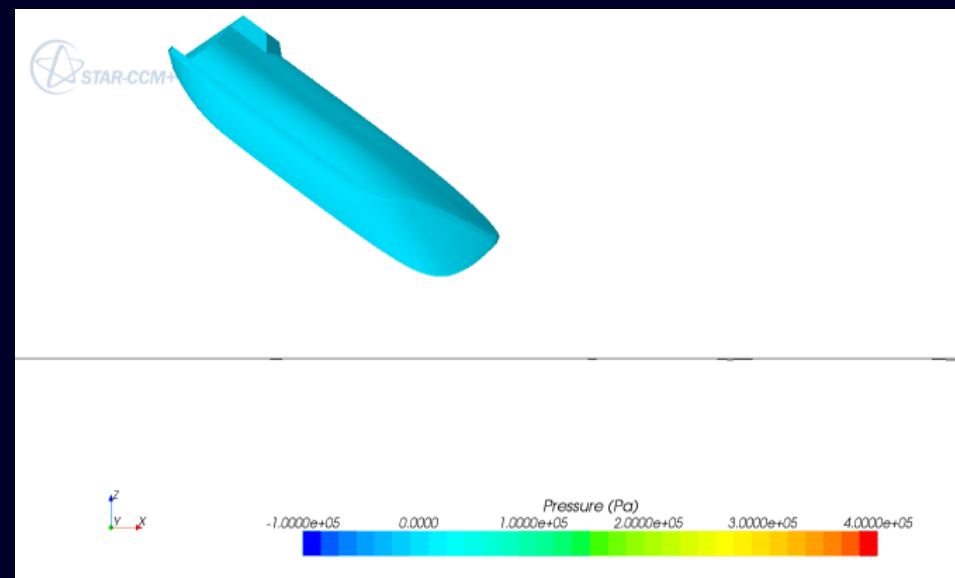
A place where fast engineering decisions are made leveraging precise robust data – Real and Digital.

Visualizing the Digital Twin in its context,
gaining insights in a realistic environment

Meet in real-time, to collaboratively review
the Digital Twin and effect changes immediately

Continuously and interactively evaluate,
simulate and predict Digital Twin behavior

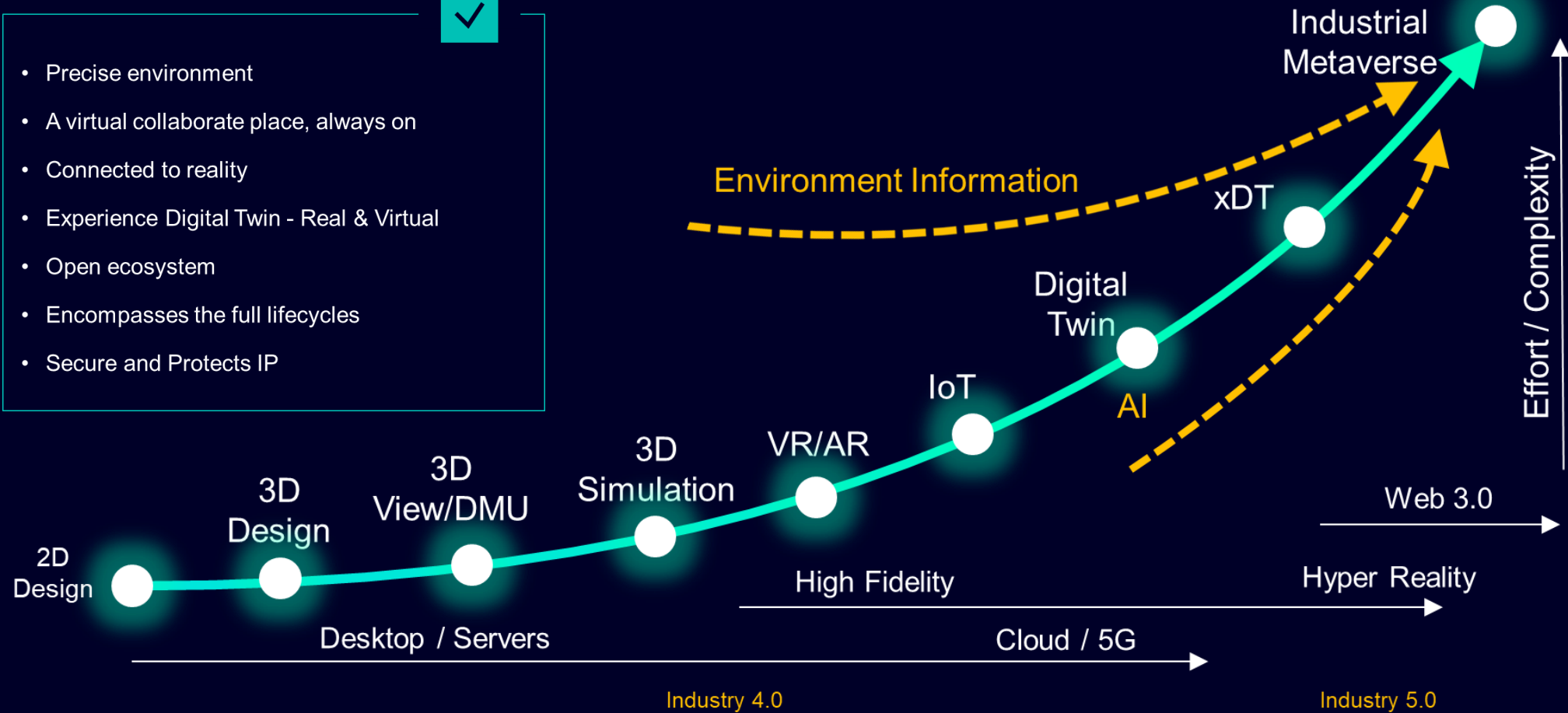
Monitor, analyze and manage real assets
in closed-loop with the Digital Twin



Industrial Metaverse An evolution, not a revolution

Some principles on Industrial Metaverse

- Precise environment
- A virtual collaborate place, always on
- Connected to reality
- Experience Digital Twin - Real & Virtual
- Open ecosystem
- Encompasses the full lifecycles
- Secure and Protects IP



What is a Comprehensive Digital Twin and why does it matter?

Precise virtual representation of a physical product or process

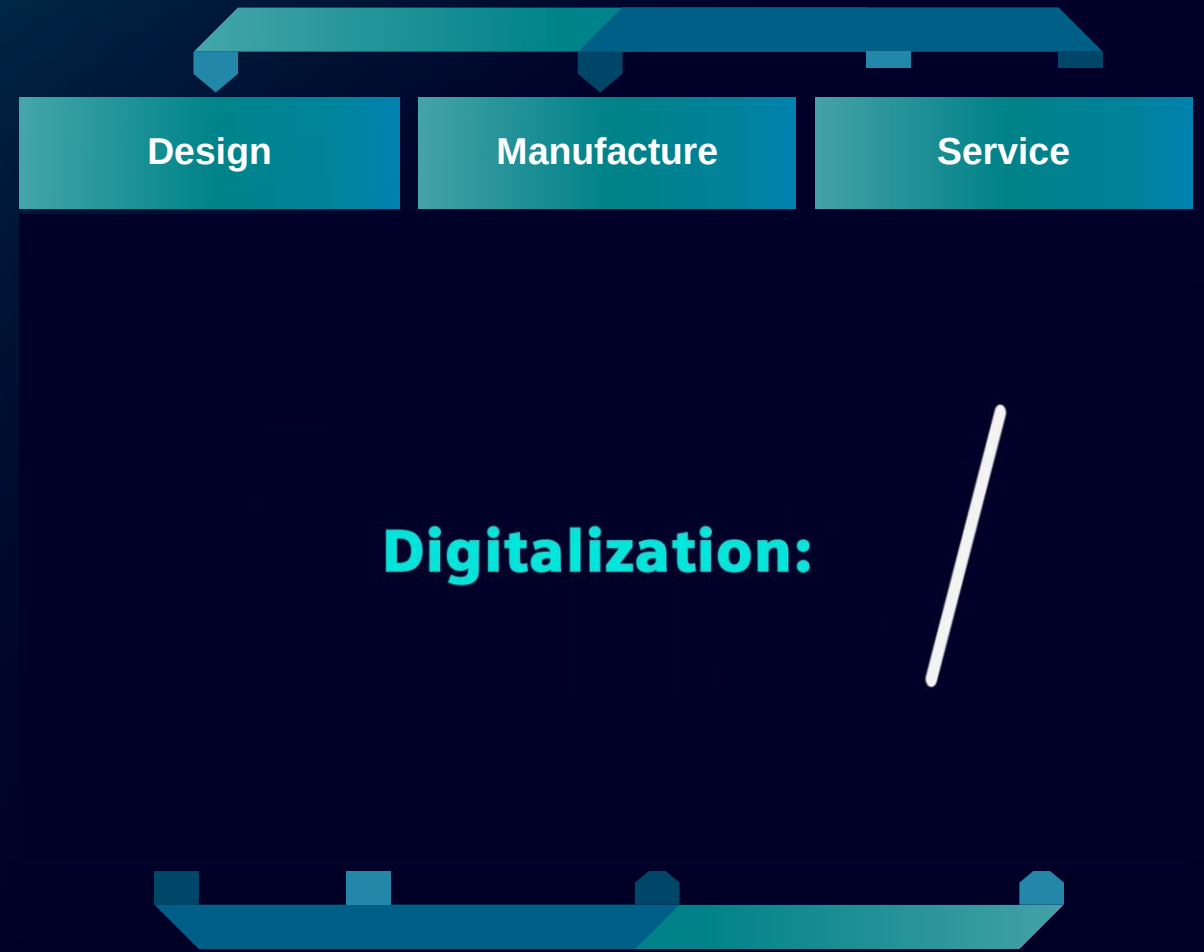
Used across its lifecycle to simulate, predict and optimize the product and production system

Made up of multiple representations or models for different aspects of physical behavior

An evolving object with a lifecycle that needs to be managed

Closed-loop digital twin provides for bi-directional connectivity between the physical asset and the virtual representation

Provides insights to continuously optimize product and production



Siemens Executable Digital Twin

for smarter products, systems processes



Self-contained executable digital behavior of an asset



Leveraged by anyone at any point in lifecycle

- **Developed and released by experts**
- **Real time enabled**
- **Self-adapting/calibrating**
- **No additional solvers required**
- **Deployed from edge to cloud**
- **Industrial Metaverse behavior of assets**



Sustainable Digital Enterprise – Product and Production lifecycles

Industrial Metaverse Use cases are managed across the Product and Production Lifecycles into six key domains for each industry

1. Product Development
2. Product Production
3. Product Performance
4. Plant Development
5. Product Operation
6. Plant Performance



Pharma



Consumer
packaged
goods



Automotive



High tech



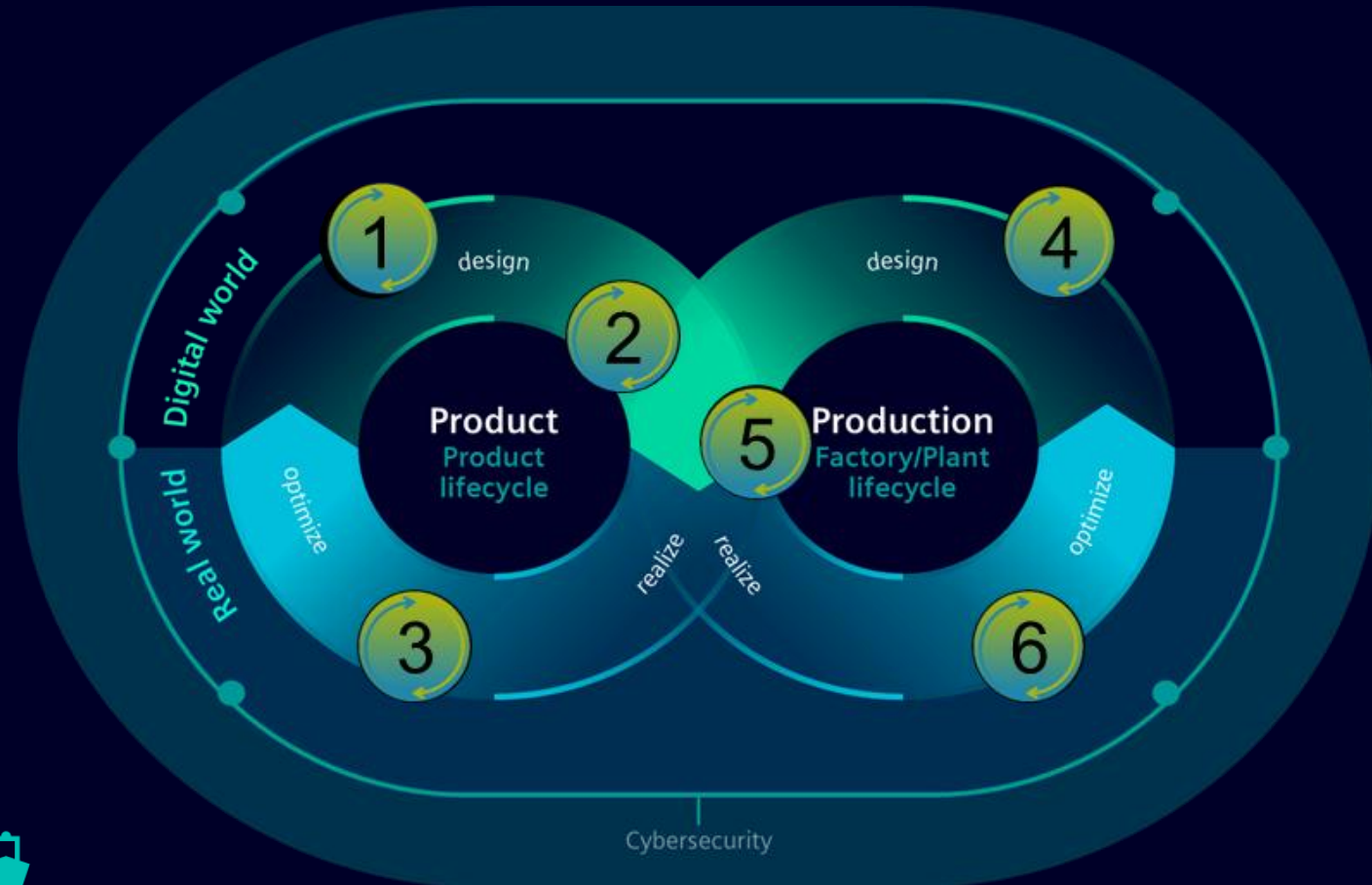
Aerospace/Def



Industrial
Machinery

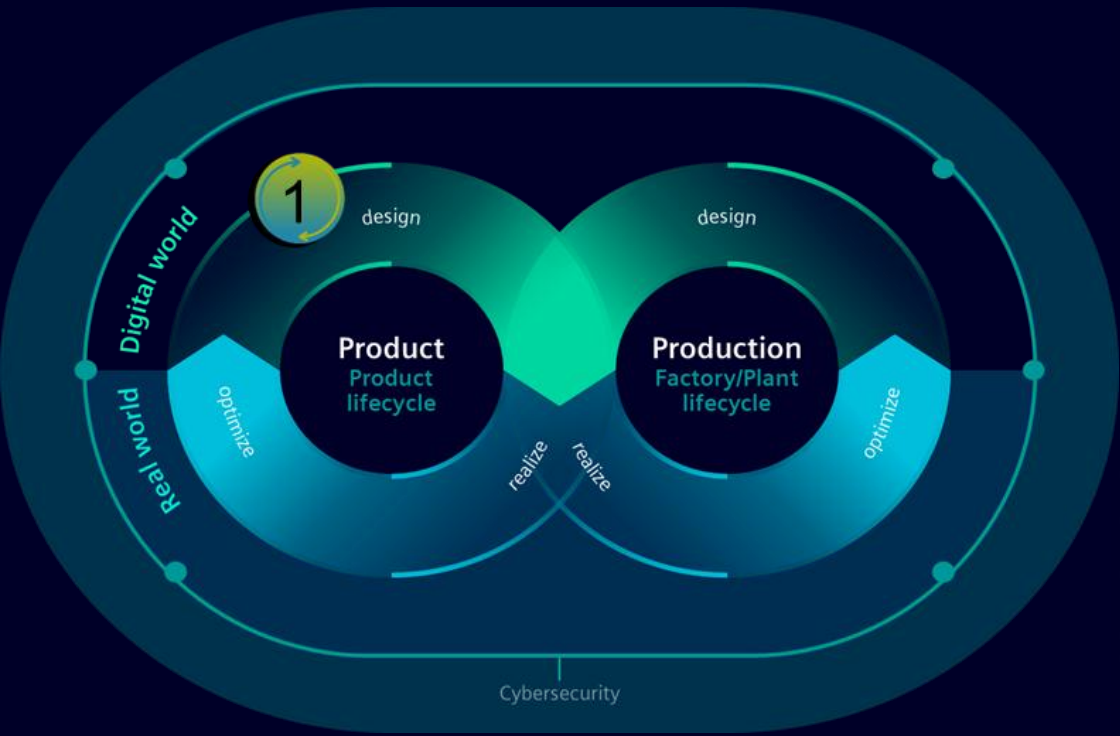


Marine

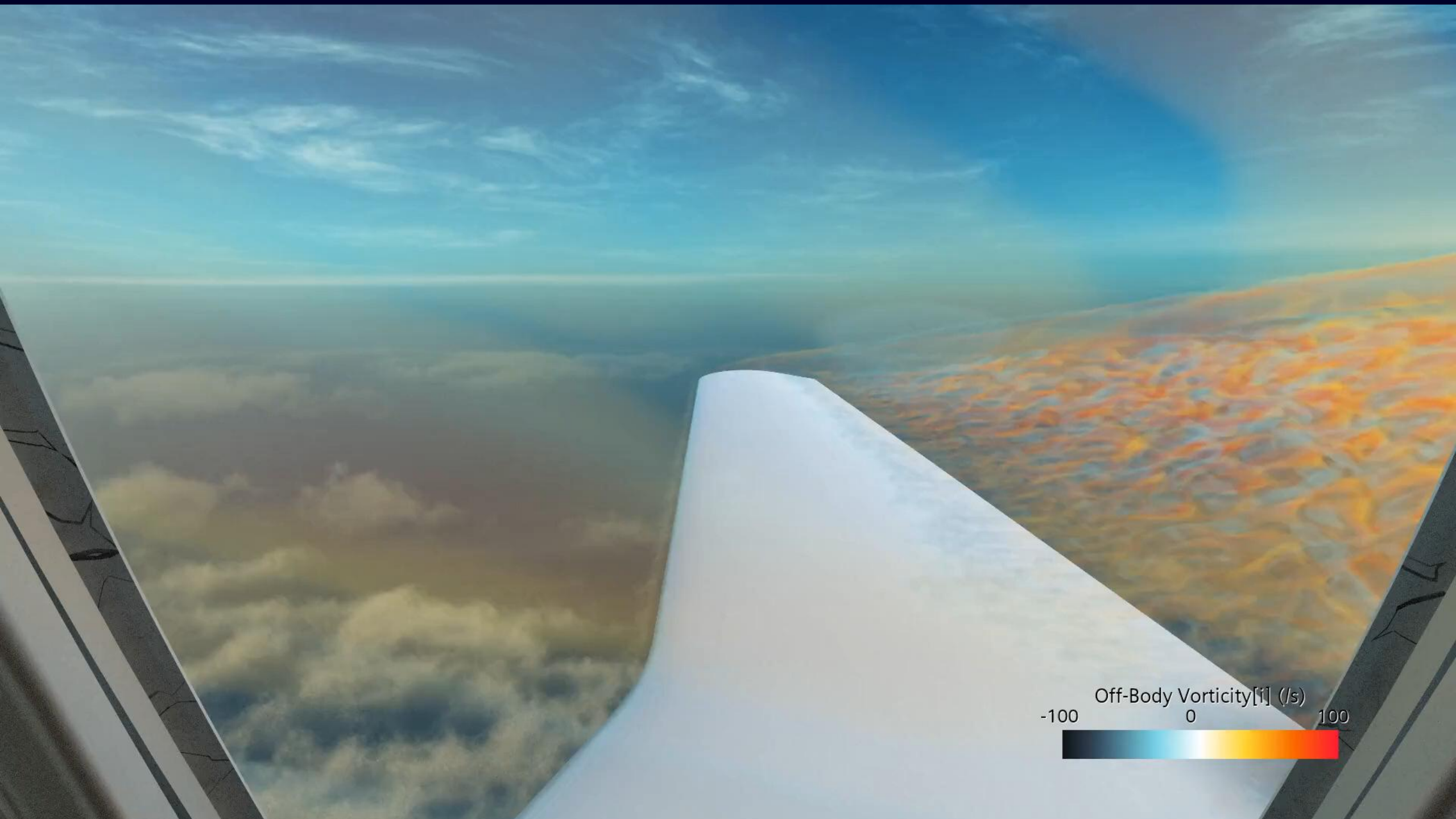


Industrial Metaverse

Eliminate physical prototypes with precise physics-based simulations in an Industrial Metaverse experience







Off-Body Vorticity [1] (/s)

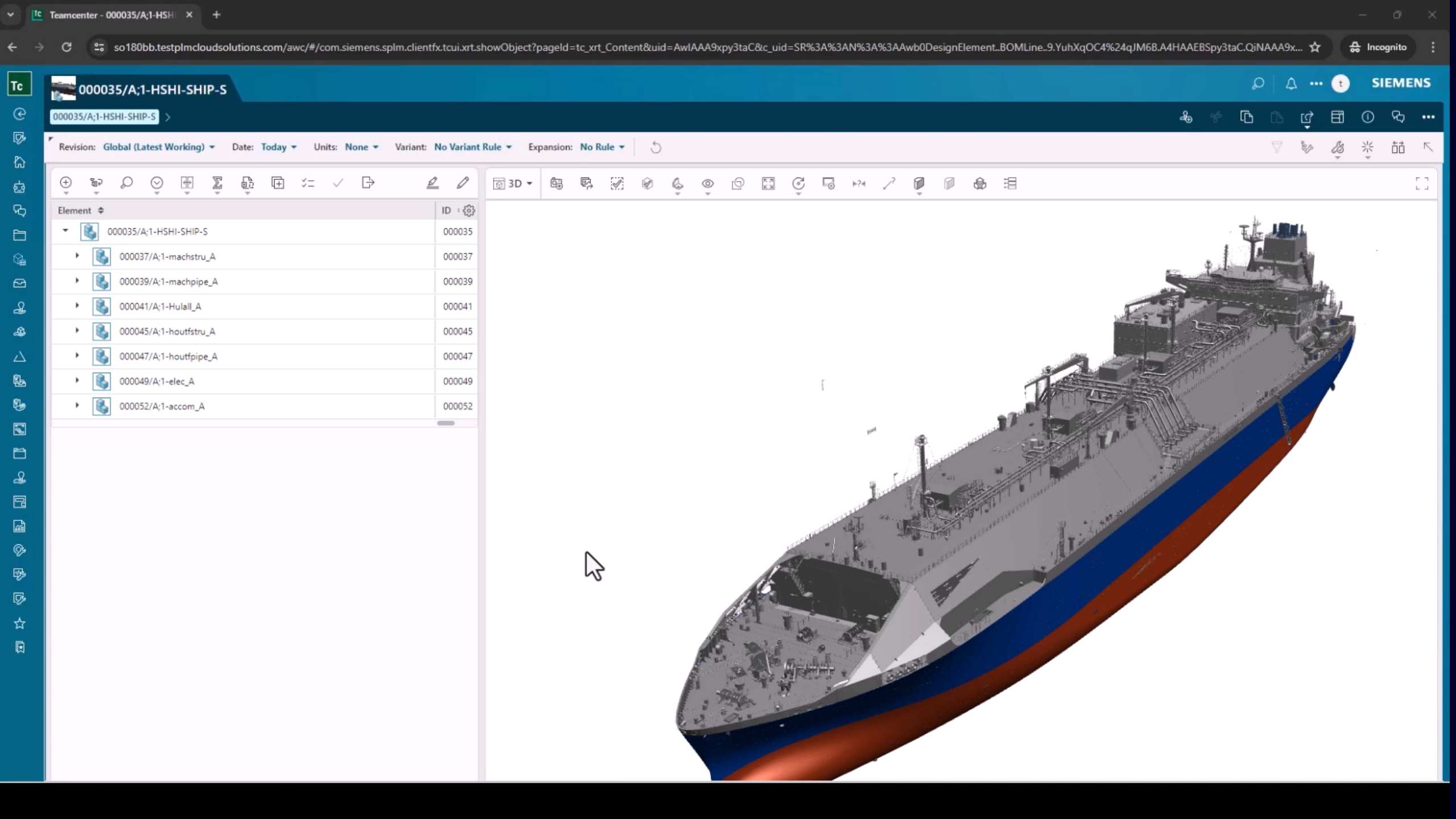
-100 0 100

Photoreal Digital Twin Visualization in Teamcenter X

Siemens Industrial Metaverse | Hannover Messe 2024







Element	ID
000035/A;1-HSHI-SHIP-S	000035
000037/A;1-machstru_A	000037
000039/A;1-machpipe_A	000039
000041/A;1-Hulall_A	000041
000045/A;1-houtfstru_A	000045
000047/A;1-houtfpipe_A	000047
000049/A;1-elec_A	000049
000052/A;1-accom_A	000052



SIEMENS

NX Immersive Designer

Seamlessly connecting the real and
digital worlds.

SONY

XR Head Mounted Display

The most natural way to experience
the Digital Twin.

Immersive Engineering

SONY hardware highlights



**4k
Resolution**
per eye



**Precision
controllers**
for engineering



**Comfortably
balanced**
for extended use



**Flip-up
visor**
for easy switching

Immersive Engineering

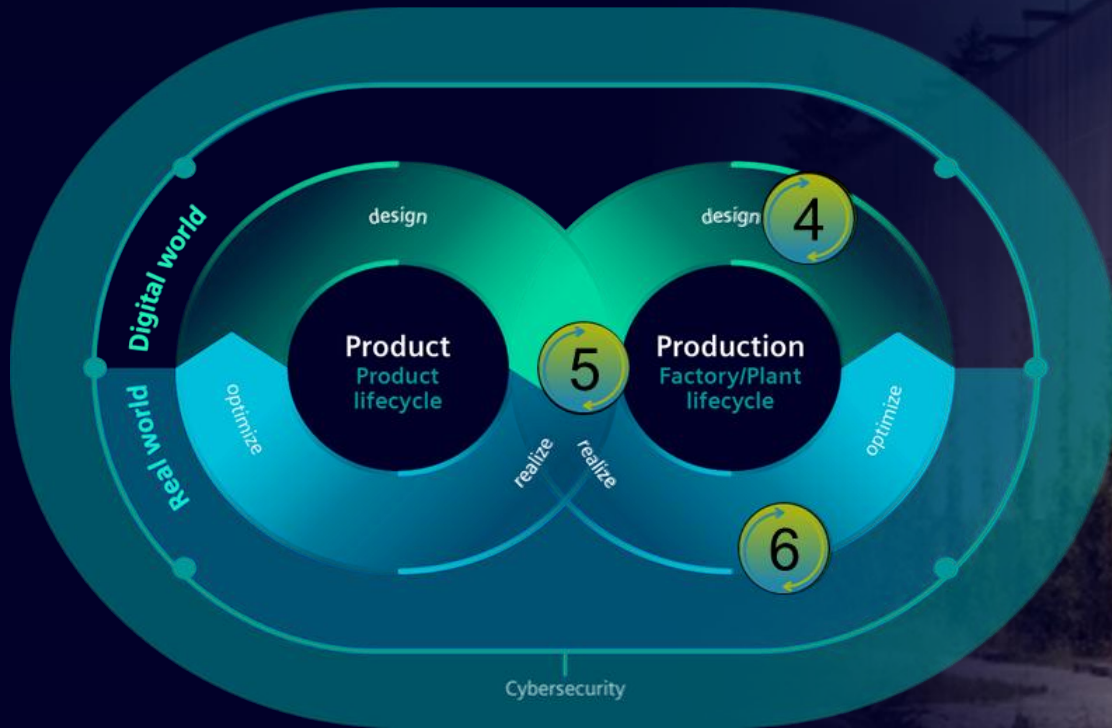
Immersive design



**Connect the real
and digital worlds
with **NX Immersive
Designer****

Industrial Metaverse

Using the Industrial Metaverse, visually interact and experience everything across a product or production lifecycle to connect design and manufacturing and scale up their production in no time.



- ✓ Leverage Industrial Metaverse to showcase capability
- 📊 Scale-up production with Siemens Xcelerator
- 🌱 Maximize plant through put and energy efficiency
- € Optimize an entire sustainable value chain



Home



Industrial Metaverse



Optimize My Plant



Energy Manager



Insights Hub OEE



Insights Hub Quality



Insights Hub Prediction



Insights Hub Asset Health and Service



?



🔔



⚙️

👤





Home



Industrial Metaverse



Optimize My Plant



Energy Manager



Insights Hub



Insights Hub Quality



Insights Hub Prediction



Insights Hub Asset Health and Service



Insights Hub



Insights Hub Quality



Insights Hub Prediction



Insights Hub Asset Health and Service



Insights Hub

Giga Arctic Factory - Norway

NVIDIA Omniverse Viewer



Information

KPI Timeseries Events Issues Issue Details Simulation Service Requests Studies



Weekly Target (%)



OEE (%)



Physical Asset Info

Insights Hub

Name: Cell Packing Robot
Type: BatteryPlantRobot
Manufacturer: Kuka
Status: OK



Virtual Asset Info

Teamcenter

Name: Robot Cell Packing
ID: VA-7653091
Revision: A
Description: Kuka cell packing robot



Performance (%)
98.0
Quality (%)
92.0
Availability (%)
95.0

Active Issues

0

Number of Cycles

127359

Last Serviced

03 March 2023

Next Service Date

03 June 2023

Mean Amb Temp

16 °C

Mean Vibration

0.000161 m/s²

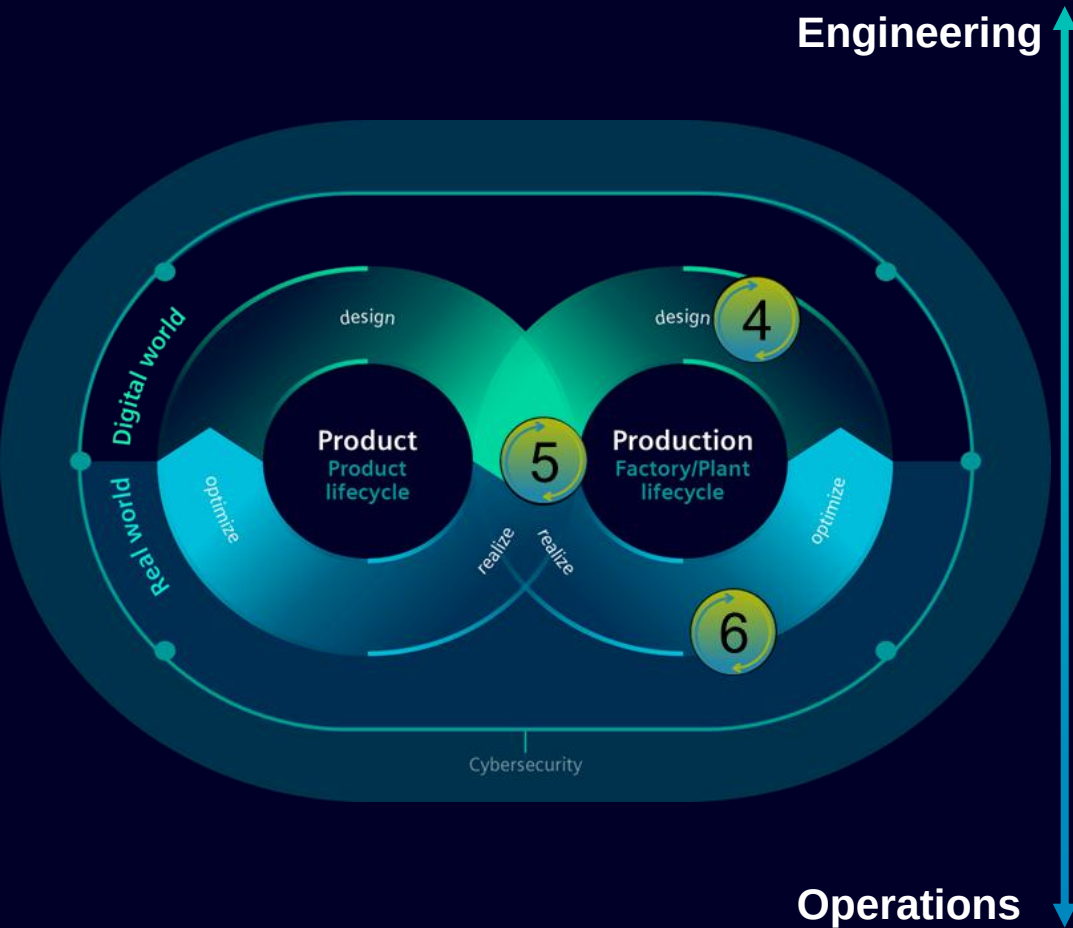
Siemens Blueprint for Industrial Metaverse

Siemens to invest €1 billion in Germany and create Blueprint for Industrial Metaverse in Nuremberg region

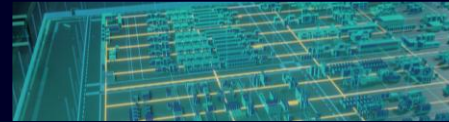
- Investment of €1 billion planned in Germany, €500m for new net-zero emissions Technology Campus in Erlangen
- Part of €2 billion global investment strategy in 2023 for boosting growth, innovation and resilience across all regions
- Further investments in Europe and the U.S.
- New campus to become global development and Manufacturing hub and nucleus for technology activities for Industrial Metaverse
- Conversion of existing site for power electronics components and machine tool controls

Siemens Blueprint for Industrial Metaverse

A holistic approach to leverage advantages of digitalization for engineering and operation



Collaborative planning



Simultaneous engineering



Collaborative problem solving



Supply chain digital twin



Machine lifecycle digital twin



Physics-based production simulation



Synthetic data generation to train algorithms



Accelerating sustainability



Customer-integrated service collaboration



Digital training and guidance



Industrial Metaverse

LOGIN

User Name

Password

Sign In



Digitalization and Industrial Software



CNC Controllers
SINUMERIK



Converters
SINAMICS



Digital
Drive Train



Customer &
Digital Services

AI & Metaverse example



Virtual manufacturing engineering

Accelerate your production process development with connected virtual multi-disciplinary engineering

Validate producibility with a reliable virtual version of production

Virtual iterative commissioning to shorten launch time

Produce sustainably by simulating energy and material usage

Gain efficiency with on-time digital guided workforce

Virtual training fleet of robot perception with physical and added synthetic data





≤ 34000

**Tons of weight
being moved**

TWIN MARINE HEAVYLIFT

Uses Simcenter STAR-CCM+ to analyze the effects of buoyancy tanks on vessel stability

Customer challenge

Transport extreme-weight offshore platforms

Design new marine lifting systems to help dismantle offshore platforms

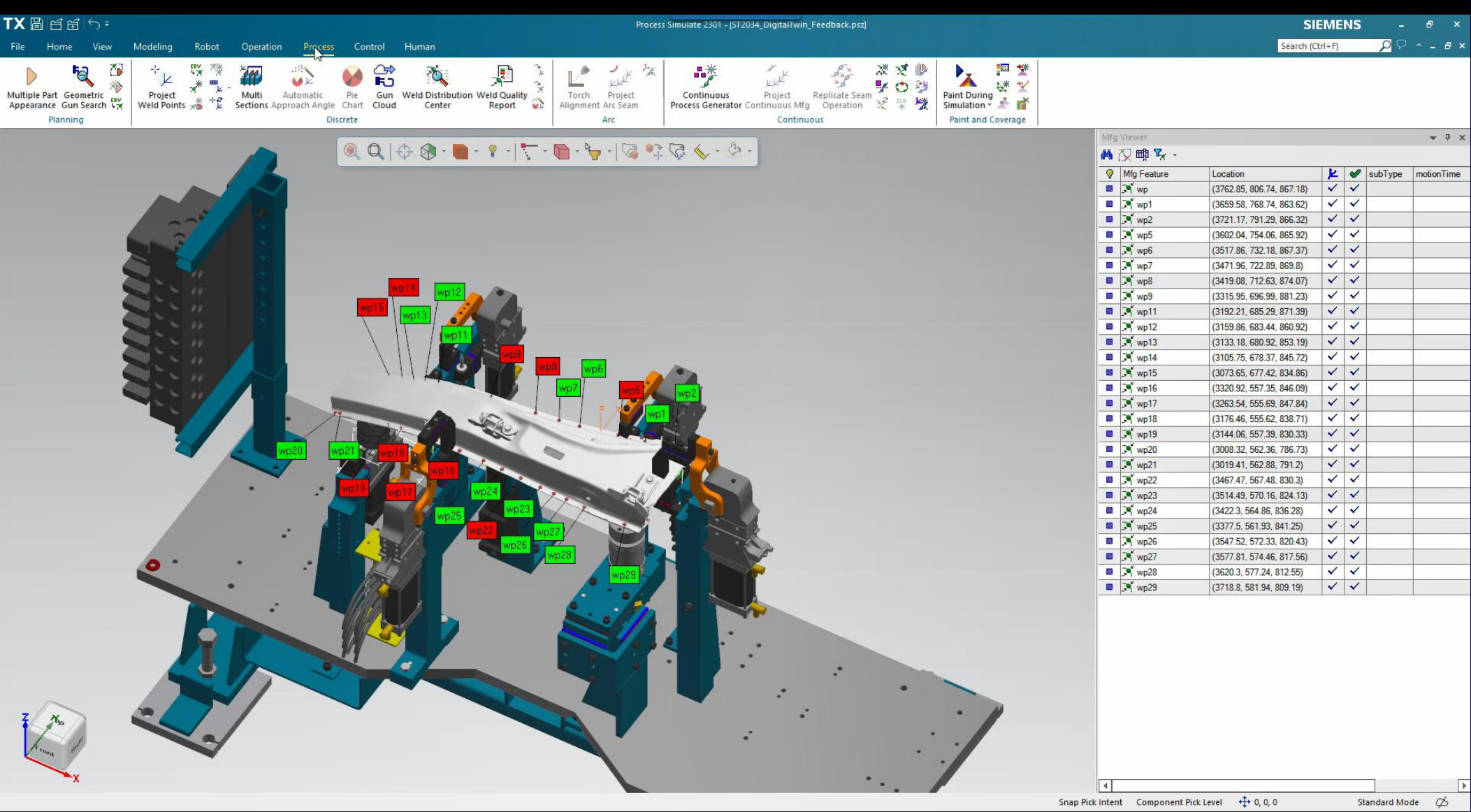
Solution

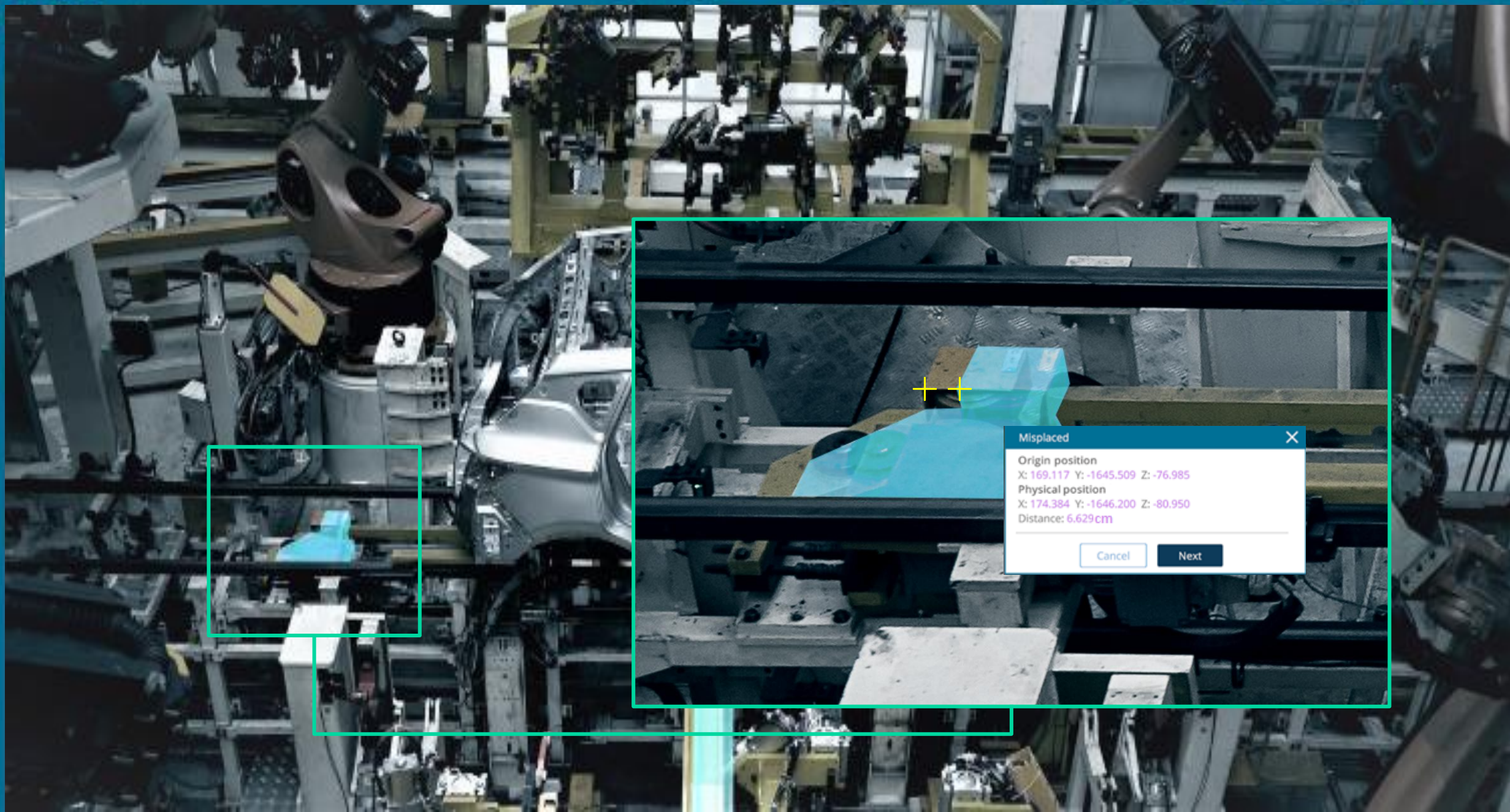
- Use Simcenter STAR-CCM+ to analyze complex water forces and course stability issues for heavy lifter
- Understand interactions between buoyancy tanks and ship's hull

Customer benefit

- Validated that Simcenter STAR-CCM+ CFD techniques can be used to predict the complex phenomena associated with marine lifting systems
- Indicated a periodic pattern of flow around the hull tanks

Automatic Reporting & Feedback Demo





Teamcenter for Microsoft Teams

Challenge

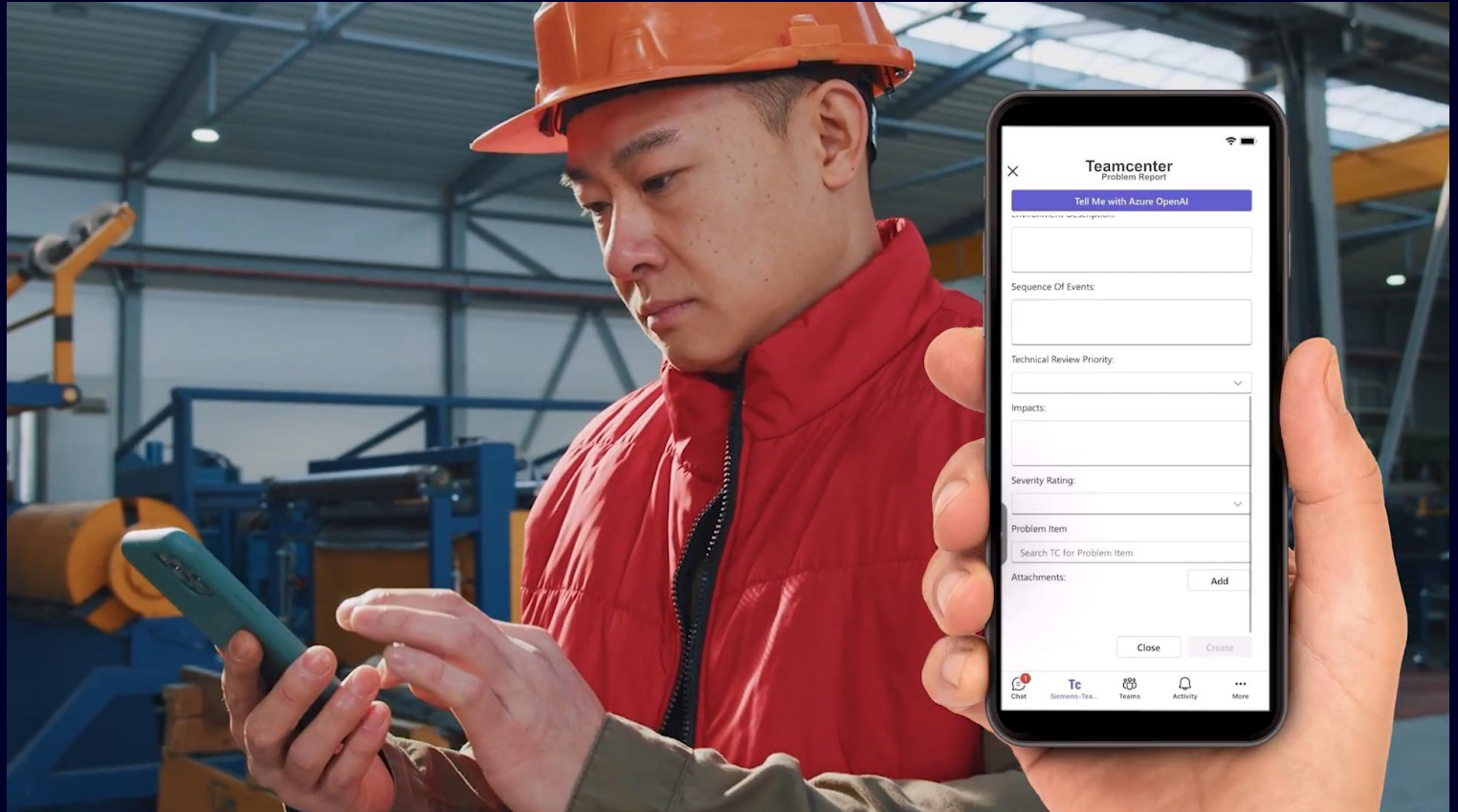
- Frontline workers can't easily communicate product issues they observe with engineers

Solution

- Teamcenter app on Microsoft Teams uses generative AI, powered by OpenAI
- Capture and report problems in real time, on any device, using natural language

Benefit

- Save time spent on filing problem issues
- Decrease number of unreported product issues



Teamcenter AI Chat

Challenge

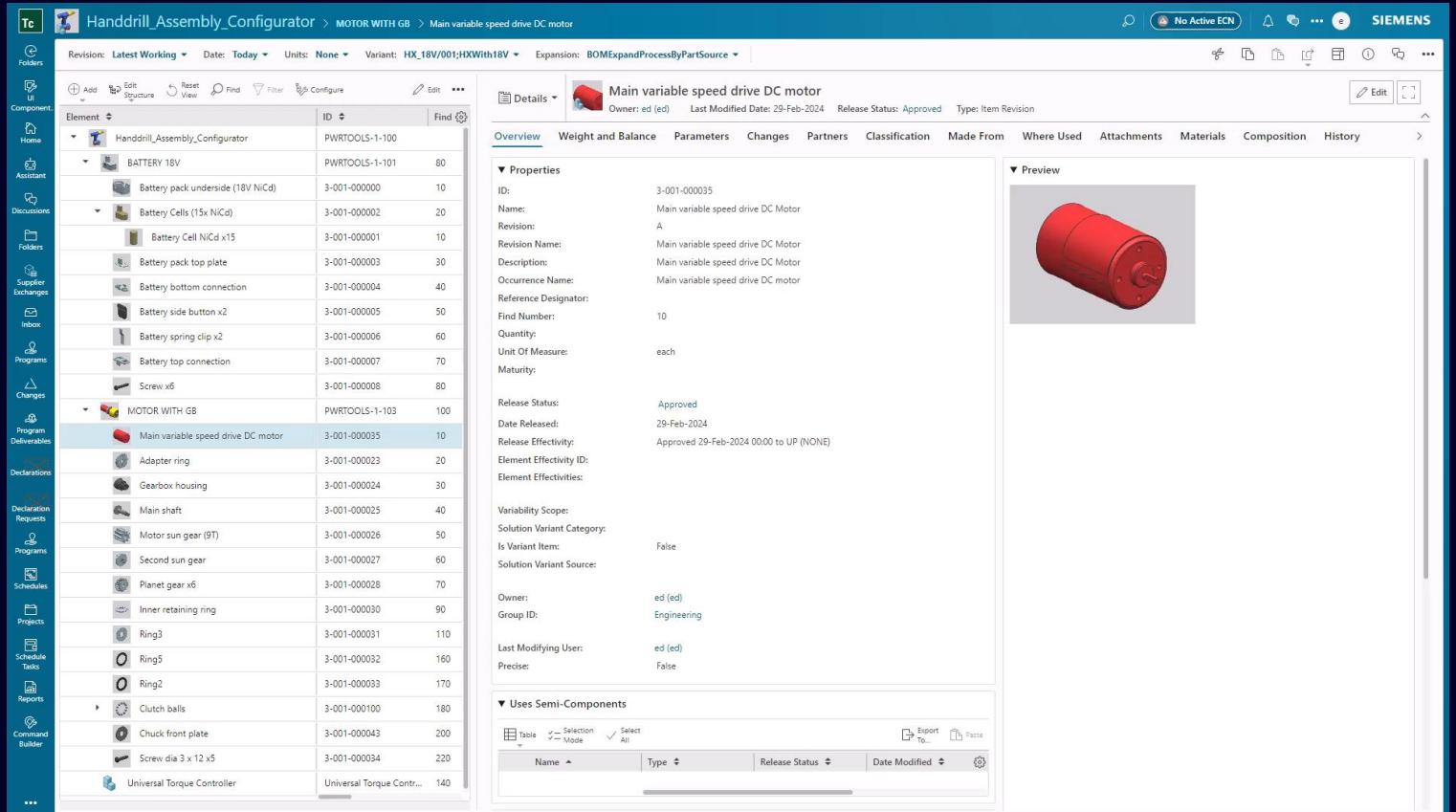
- Locating information buried in documents

Solution

- AI-powered chatbot enables natural language query of document-based knowledge in your Teamcenter environment
- RAG architecture grounds LLM responses in your data and adheres to access management policies

Benefit

- Find information faster / easier
- Traceability of document / information sources



AI Copilot NX X Only

Challenge

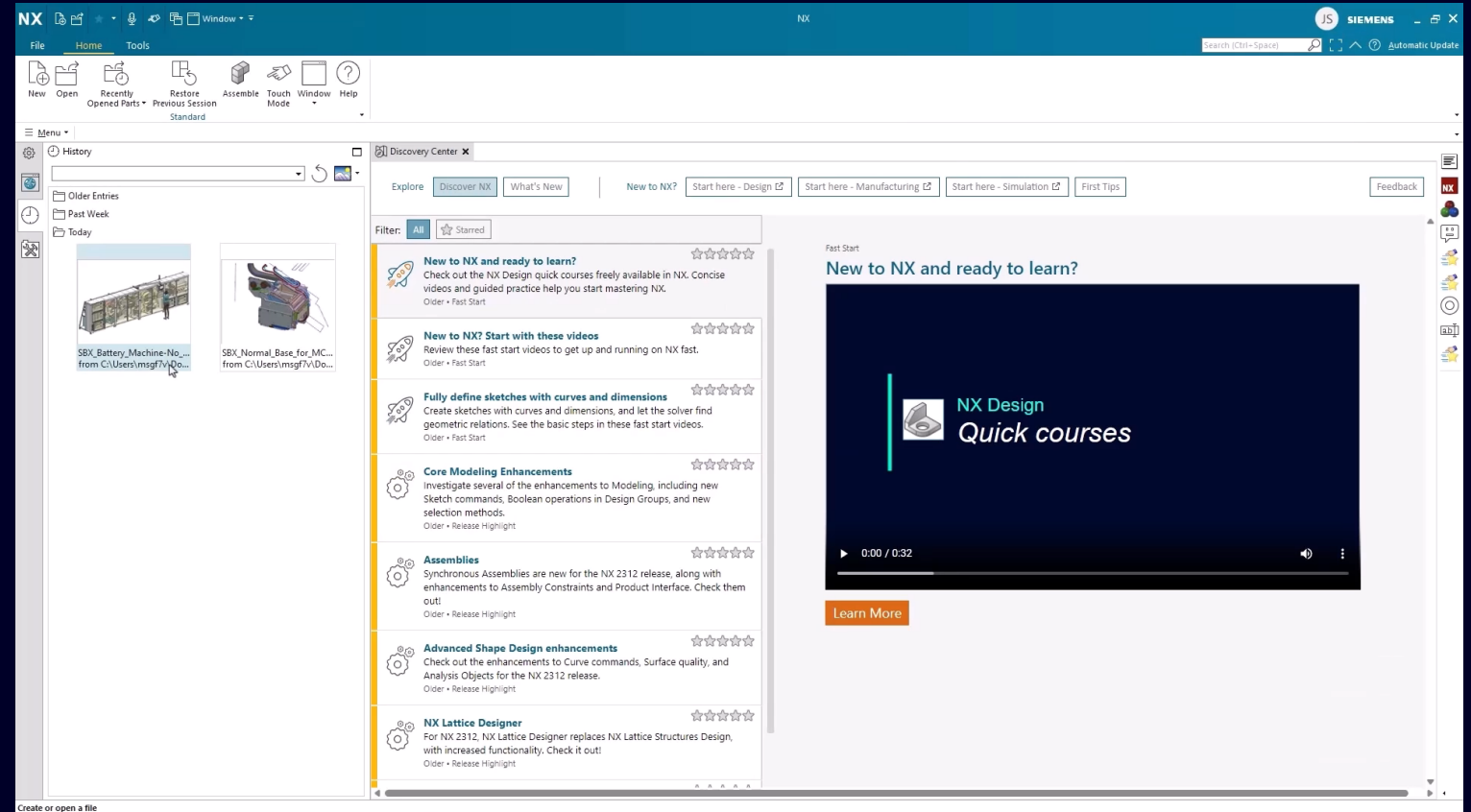
- How do perform a task in NX X?

Solution

- AI-powered chatbot enables natural language query of NX documentation
- You giving, ask your question in your natural language.

Benefit

- Find information faster / easier
- In addition to giving, you the answer it has the links to directly run the needed NX command.



Tecnomatix Process Simulate Collaborate Ergonomics

Challenge

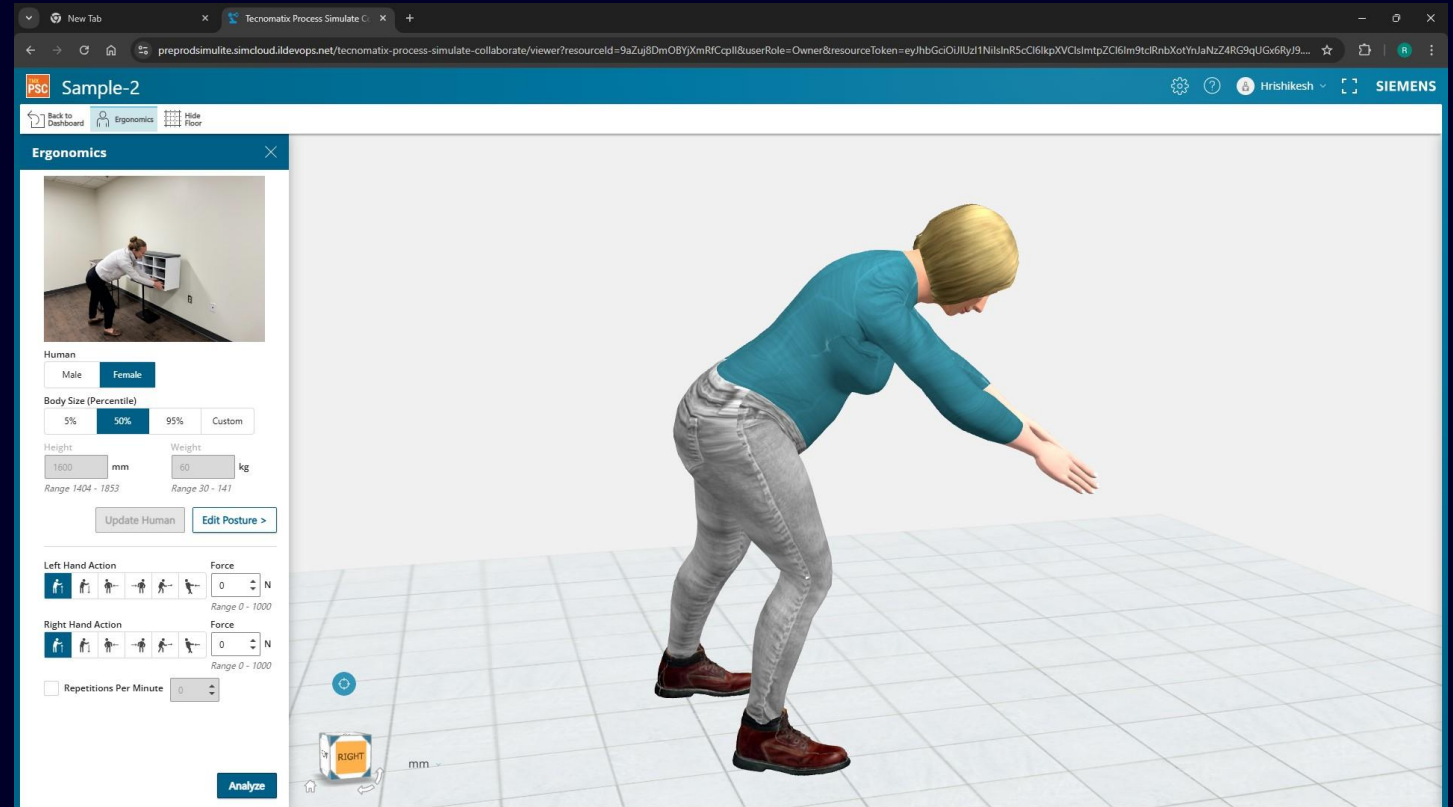
- Accurate 3D posture modelling is vital for valid ergonomic analyses but can be time-intensive & requires expertise.

Solution

- An AI-based tool to automatically generate 3d human poses from a basic photograph

Benefit

- Advanced posture modelling with minimal time and effort.
- Instant access to detailed results online.



[Link to video](#)

Released

Insights Hub Quality Prediction: Use AI to improve quality and reduce rework costs

Challenge

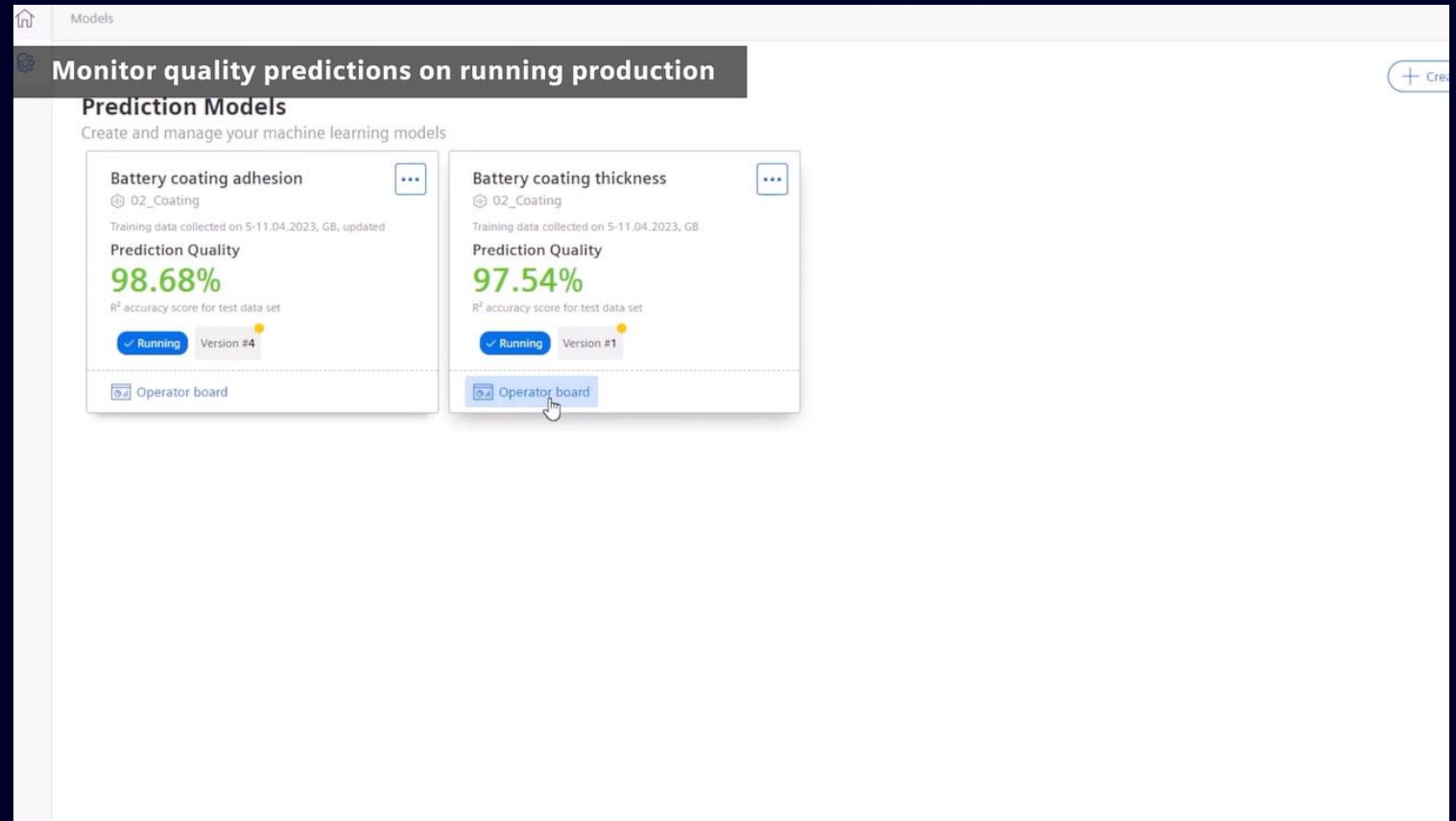
- Improve insight on how process parameters impact quality as well as detect or avoid deficient parts

Solution

- Use a quality prediction model to identify process parameters with the highest impact on quality and constantly monitor quality of operations in production

Benefit

- Less rework, less unnecessary measurement costs, more efficient use of resources



Insights Hub Edge Analytics: Detect machine health issues automatically

Challenge

- Significant cost impact of equipment downtime across industries
- Early symptoms were present but were neither recognized nor analyzed

Solution

- Add vibration data as early condition indicator
- Preprocess data on the edge incl. automatic detection of anomalies in frequency spectra
- Inform maintenance teams and provide means for RCA

Benefit

- Higher machine availability
- Reduced maintenance cost

